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## ABSTRACT

A study compared the perceptions of Pennsylvania laboratory directors and medical technology educators relative to career-entry competencies for associate degree medical laboratory technicians (MLTs) and baccalaureate medical technology (MT) graduates. A 55-item competency questionnaire was administered to 265 hospital laboratory directors and 40 medical technology education coordinators from accredited baccalaureate and associate medical technologist programs in Pennsylvania. The questionnaire sought respondent's preferences for student performance of tasks in the following four areas: hematology, immunohematology, clinical chemistry, and clinical microbiology. A series of chi-square analyses conducted on an item-by-item basis within each of those disciplines indicated significant differences between the perceptions of the respondents on 22 percent of the 55 competency items. There was a tendency for many items to be selected as appropriate for both levels of graduates. While the respondents did not differ greatly in their perceptions on routine performance tasks expected of the MLT and MT, they did differ when identifying the practitioner responsible for a number of tasks requiring a higher degree of judgment. In general, the medical technology educators were more conservative than the laboratory directors, and, as anticipated, restricted most of the higher level performance tasks to the MT. (MN)

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A COMPARISON OF THE PERCEPTIONS OF LABORATORY DIRECTORS  
AND MEDICAL TECHNOLOGY EDUCATORS TOWARD CAREER-ENTRY  
COMPETENCIES FOR ASSOCIATE AND BACCALAUREATE  
DEGREE LABORATORY TECHNOLOGY GRADUATES

CE030 212

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## Career-Entry Competencies for MLT and MT Graduates

### ABSTRACT

This is a report of a study undertaken to investigate the perceptions of laboratory directors and medical technology educators, in the Commonwealth of Pennsylvania, relative to career-entry competencies for associate degree medical laboratory technician (MLT) and baccalaureate degree medical technology (MT) graduates. A 55 competency item questionnaire was utilized to obtain the data and a series of chi-square ( $\chi^2$ ) analyses were conducted on an item by item basis within each of the disciplines of laboratory technology. The results indicated that there is a significant difference between the perceptions of the respondents on 12 or 22 percent of the 55 competency items. Similarities and differences in the expectations of these laboratory professionals concerning performance skills for future practitioners are examined.

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## INTRODUCTION

During the past decade, laboratory technology has experienced significant growth and increased technological complexity. Concomitant with growth and complexity are the changing duties and responsibilities of laboratory practitioners. Presently, there appears to be no clear differentiation between the functioning of the associate degree medical laboratory technician (MLT) and the baccalaureate degree medical technology (MT) graduate in the clinical work environment.

The medical technology educator is charged with the mission to educate future laboratorians to perform efficiently and effectively as members of the health care team toward the goal of improved patient care. To this end, NAACLS requires documentation that competency requirements and learning activities for MLT and MT students be appropriately delineated. Despite the differences in goals and objectives of the educational programs, actual observation of the graduates in the work setting indicates little difference between them. The objective to educate future professionals remains the same, but confusion arises when attempting to develop relevant curricula to meet undefined work roles.

To keep pace with new classifications of health personnel, Henderhan and Schroeder<sup>4</sup> believe that educators must reevaluate their curricula in terms of current job requirements. They concluded that this is best accomplished by determining the professional expectations of the experts in the field. Thus, this study was conducted to address the research ques-

tions, (1) do medical technology educators and laboratory directors differ in their expectations of career-entry competencies for MLT and MT graduates, (2) is there a significant difference in the perceptions of laboratory directors based upon size and location of hospital laboratories regarding expected competencies for these two levels of laboratorians?

Medline and Eric searches were made for publications relating to similar studies which differentiate competency expectations of laboratory technology graduates. Forty-five titles in available journals were generated by the searches and these articles were reviewed for applicability to this study. Literature on competency development is abundant, but little attention has been given to studies which delineate the performance of the various levels of graduates in the clinical laboratories.

Results from a study of all certified laboratorians in Iowa by Gleich and Routh<sup>3</sup> indicated that a relationship exists between hospital size and level of education with the more highly educated employed in the larger hospitals. Nonbaccalaureate personnel were more often found working in smaller hospitals. In addition, the study concluded that the baccalaureate graduate was found in supervisory positions and the MLT individual generally performed the routine laboratory procedures. In an attempt to determine if a discrepancy exists between the level of educational objectives and the performance of clinical tasks, McBride and Murphy<sup>6</sup> surveyed 25 MLT and 46 MT practitioners employed in the Houston and Fort Worth area. They selected 26 specific tasks from the four dis-

ciplines of laboratory technology and requested that the respondents identify who actually performs the task in their respective place of employment. The results of the study showed that MLT and MT graduates are performing approximately the same clinical laboratory tasks. The authors concluded that educational objectives and competencies that are developed for MLT and MT programs are guides only for curricular development, and not for job performance.

A survey was undertaken by Cohen and Korper<sup>2</sup> to provide information on the patterns of employment of laboratory technology graduates in Connecticut. The study focused on CIA, MLT and MT practitioners, and one of the objectives was to obtain the graduates' perception of usefulness of education in subsequent employment. Questionnaires were mailed to 436 graduates of 19 clinical education programs for the years 1968, 1970, 1972 and 1974. Responses to questions concerning applicability of education to employment showed that the majority of the respondents expressed positive comments about both their theoretical and practical education and utilization of their skills throughout their job history. While no significant differences were observed, a higher proportion of MTs (77 percent) in their first job felt that their theoretical education had been more essential to their work than did the CIAs or the MLTs (56 percent).

## METHODOLOGY

### Instrumentation

A three demographic item and 55 competency item survey instrument was developed primarily by means of adaptation and modification of performance tasks presented in the following sources: (1) Kettering Medical Center, Career Entry Job Description for MLT/MT, 1977; (2) American Society for Medical Technology, Competence Delineation Committee, Statements of Competency for Clinical Laboratory Personnel, 1976; and (3) Hahnemann Medical Technology Programs' objectives and learning contracts. The 55 competency items were divided into the four major divisions of laboratory technology: Hematology, Immunology including Immunohematology, Clinical Chemistry including Microscopy and Clinical Microbiology. The respondents were asked to indicate whether they perceived each competency to be an expectation of both MT and MLT graduates or MT graduates only.

Reliability of the questionnaire was determined by means of the test-retest method. The computed Pearson  $r$  was  $+0.90$ , thus indicating that the instrument was sufficiently reliable. To check for validity, the questionnaire was examined by four medical technology faculty members with expertise in all areas of laboratory technology. After review by these individuals, modifications were made and the edited instrument was piloted to a panel of experts which was comprised of three laboratory directors not part of the sample to be surveyed, three laboratory technology educators also not part of the study population and three clinical labora-

tory supervisors. A critical evaluation was requested and several changes were made after receipt of comments.

#### Population

The total population consisted of the 265 hospital laboratory directors in the Commonwealth of Pennsylvania, and the 40 medical technology education coordinators from accredited baccalaureate degree MT and associate degree MLT programs within the State. In an effort to secure the views of as many laboratory professionals functioning in different settings, a large subset of the population was used for the study. To obtain the samples, a random sample of 50 percent of the laboratory directors and 100 percent of the educators was selected. The primary intent of this sampling procedure was to achieve representativeness among the respondents.

A list of all Pennsylvania hospital laboratories and the names of the directors of said laboratories were secured from the Pennsylvania Department of Health. The names of the education coordinators of the accredited MLT and MT Programs were obtained from the AMA, Allied Medical Education Directory, 1979. The questionnaire and a letter explaining the intent of the study were mailed to the sample population. One month later, a follow-up letter and questionnaire were mailed to nonrespondents, and at the end of another four weeks the number of returns was considered closed.

#### Procedure for Treating the Data

The returned questionnaires were manually tabulated and the statis-

tical technique which was used to assess the data was the nonparametric chi-square ( $X^2$ ) test to determine equality of proportions between groups. Since the intent of the study was to determine where similarities and differences exist in the competency requirements, a series of  $X^2$  analyses were conducted on an item by item basis within each of the disciplines of laboratory technology.

To determine whether significant differences exist, the calculated  $X^2$  values were compared with appropriate critical values. Two factors were used to find the critical value: (1) the degrees of freedom (df) associated with the  $X^2$  test and (2) the level of significance which was established at the .01 level. Computation of items times groups to be observed indicated that at the .05 confidence level there was a possibility of 10 items being significant by chance alone, thus the .01 level of significance was used for the study.

For the purposes of examining the data, overall responses of the laboratory directors were compared to those of the medical technology educators. The laboratory directors were then separated into four groups and their perceptions noted. The groups were: (1) urban, less than 200 bed hospital; (2) rural, less than 200 bed hospital; (3) urban, more than 200 bed hospital and; (4) rural, more than 200 bed hospitals.

## RESULTS

A total of 172 questionnaires were mailed to the 132 laboratory directors and the 40 educators identified for the samples. One hundred and three of the survey instruments were returned for a 60 percent response rate. The overall response rate of the laboratory directors was 55 percent as compared to 77 percent for the medical technology educators.

### Comparison of Responses

#### Hematology

Table 1 shows the  $X^2$  value on each of the 12 Hematology performance tasks when comparing the responses of the laboratory directors to those of the medical technology educators. As evidenced from the data, there is a significant difference in the perceptions of these laboratory professionals on two Hematology task items.

On task item six, 28 or 90 percent of the medical technology educators responded that trouble shooting coagulation procedural problems should be performed by both the MLT and MT graduate, whereas 27 or 37 percent of the laboratory directors felt this task should be reserved for MT graduates. Task item six resulted in a  $X^2$  value of 11.97, which is significant at the .01 level.

Hematology task item eight is highly significant at the .01 level with a calculated  $X^2$  value of 62.75. Twenty-eight or 90 percent of the educators stated that performing routine cytochemistry stains on blood

Table 1  
Total Respondents' Preference for Performance of Hematology Tasks

| Tasks                                                                                                      | Respondents                            |            |           |                                |            |                        | X <sup>2</sup> Values |
|------------------------------------------------------------------------------------------------------------|----------------------------------------|------------|-----------|--------------------------------|------------|------------------------|-----------------------|
|                                                                                                            | Medical Technology Educators<br>N = 31 |            |           | Laboratory Directors<br>N = 72 |            |                        |                       |
|                                                                                                            | MLT<br>and<br>MT                       | MT<br>Only | Total     | MLT<br>and<br>MT               | MT<br>Only | Total                  |                       |
| 1. Enumerate formed elements in blood using microscopic and instrumental techniques.                       | 31 (100%)                              | 0 (0%)     | 31 (100%) | 72 (100%)                      | 0 (0%)     | 72 (100%)              | 0                     |
| 2. Perform daily maintenance and calibration of automated cell counting equipment.                         | 31 (100%)                              | 0 (0%)     | 31 (100%) | 68 (94%)                       | 4 (6%)     | 72 (100%)              | 1.79                  |
| 3. Identify immature or abnormal cells on bone marrow smears.                                              | 2 (6%)                                 | 29 (94%)   | 31 (100%) | 12 (18%)                       | 56 (82%)   | 68 <sup>a</sup> (100%) | 2.20                  |
| 4. Interpret quality control records and identify need for change in procedures.                           | 3 (10%)                                | 28 (90%)   | 31 (100%) | 16 (22%)                       | 56 (78%)   | 72 (100%)              | 2.27                  |
| 5. Compare indices with morphologic and quantitative data.                                                 | 29 (94%)                               | 2 (6%)     | 31 (100%) | 65 (90%)                       | 7 (10%)    | 72 (100%)              | 0.29                  |
| 6. Troubleshoot coagulation procedural problems.                                                           | 28 (90%)                               | 3 (10%)    | 31 (100%) | 45 (63%)                       | 27 (37%)   | 72 (100%)              | 8.13 <sup>a</sup>     |
| 7. Correlate hematology values and determine appropriateness of results on the basis of disease processes. | 7 (23%)                                | 24 (77%)   | 31 (100%) | 18 (27%)                       | 48 (73%)   | 66 <sup>b</sup> (100%) | 0.24                  |
| 8. Perform routine cytochemistry stains on blood smears.                                                   | 3 (10%)                                | 28 (90%)   | 31 (100%) | 65 (90%)                       | 7 (10%)    | 72 (100%)              | 62.75 <sup>a</sup>    |
| 9. Select appropriate reagents and instruments essential to the specifications of the analysis.            | 14 (45%)                               | 17 (55%)   | 31 (100%) | 31 (44%)                       | 40 (56%)   | 71 <sup>c</sup> (100%) | 0.02                  |
| 10. Perform cell enzyme assays and special stains.                                                         | 16 (52%)                               | 15 (48%)   | 31 (100%) | 45 (63%)                       | 26 (37%)   | 71 <sup>c</sup> (100%) | 1.24                  |
| 11. Perform and interpret routine coagulation studies.                                                     | 25 (81%)                               | 6 (19%)    | 31 (100%) | 63 (88%)                       | 9 (12%)    | 72 (100%)              | 0.82                  |
| 12. Perform and identify normal and abnormal cells on peripheral smears.                                   | 28 (90%)                               | 3 (10%)    | 31 (100%) | 67 (93%)                       | 5 (7%)     | 72 (100%)              | 0.23                  |

<sup>a</sup>Four respondents stated an M.D. should perform the task.

<sup>b</sup>Six respondents stated an M.D. should perform the task.

<sup>c</sup>One respondent stated an M.D. should perform the task.

<sup>\*</sup>Significant at the .01 level ( $X^2 = 6.64$ ,  $df = 1$ ).

smears is a MT competency, while 65 or 90 percent of the laboratory directors perceived this competency to be required of both MLT and MT graduates.

It should be noted from the data that some of the laboratory directors believe that a physician/pathologist is required for appropriate performance of a number of the tasks. The medical technology educators did not view any of the behaviors to be of such a complex nature that the expertise of an M.D. was necessary. This trend continued through each of the divisions of laboratory technology.

Comments cited by the laboratory directors concerning this preference included the following:

I strongly disagree with your assumption of what technical people are supposed to be able to interpret. This is not a Victorian philosophy - just hard fact. At this institution, pathologists make the above decisions. There is more than ample discussion with MT, MLT or CIA personnel by one of us and that's the way it should be. (Urban laboratory director, > 200 bed hospital)

Responsibility for evaluation of test results in light of other clinical data on the patient should be for the pathologist. (Rural laboratory director, > 200 bed hospital)

As evidenced from the Hematology data, responses from the medical technology educators show a considerable amount of disagreement relative to assignment of the performer for tasks nine and ten. The educators were divided with approximately 50 percent stating that both MT and MLT practitioners may perform cell enzyme assays, special stains and select appropriate reagents and instruments for Hematology studies, although the other half felt these were MT activities.

### Immunohematology

As indicated in Table 2, the computed  $\chi^2$  value is significant at the .01 level for tasks three, six and eight when contrasting the perceptions of the laboratory directors and the medical technology educators in the division of Immunohematology. The calculated  $\chi^2$  value for task item three is 8.38; for item six is 8.36; and 14.15 for item eight.

Only three or 10 percent of the medical technology educators considered task three, investigation of transfusion reactions as a required behavior for both levels of graduates. Twenty-six or 38 percent of the laboratory directors perceived both the MLT and the MT sufficiently able to undertake this investigation.

Twenty-seven or 87 percent of the medical technology educators are of the opinion that task six, implementing a system for selecting and issuing blood is a MT competency. Thirty or 42 percent of the laboratory directors identified this as a necessary skill for both MLT and MT graduates.

On Immunohematology task eight, 29 or 94 percent of the educators restricted interpretation of quality control data to the MT. Forty-four percent or 32 of the laboratory directors expected both MLT and MT practitioners to be knowledgeable in this area.

It is interesting to note that item 13 evoked considerable disagreement within the medical technology educators, but not between the educators and the laboratory directors. Fifteen or 48 percent of the

Table 2  
Total Respondents' Preference for Performance of Immunohematology Tasks

| Tasks                                                                                                                                 | Respondents                            |            |           |                                |            |                        | x <sup>2</sup> Values |
|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------|-----------|--------------------------------|------------|------------------------|-----------------------|
|                                                                                                                                       | Medical Technology Educators<br>N = 31 |            |           | Laboratory Directors<br>N = 72 |            |                        |                       |
|                                                                                                                                       | MLT<br>and<br>MT                       | MT<br>Only | Total     | MLT<br>and<br>MT               | MT<br>Only | Total                  |                       |
| 1. Type, screen and crossmatch blood for transfusion.                                                                                 | 30 (97%)                               | 1 (3%)     | 31 (100%) | 69 (96%)                       | 3 (4%)     | 72 (100%)              | 0.05                  |
| 2. Perform antibody identification utilizing cell panels.                                                                             | 28 (90%)                               | 3 (10%)    | 31 (100%) | 57 (79%)                       | 15 (21%)   | 72 (100%)              | 1.87                  |
| 3. Investigate transfusion reactions and identify possible cause by integrative immunological investigation with other clinical data. | 3 (10%)                                | 28 (90%)   | 31 (100%) | 26 (38%)                       | 42 (62%)   | 68 <sup>a</sup> (100%) | 8.38 <sup>a</sup>     |
| 4. Determine donor eligibility and perform donor phlebotomy.                                                                          | 25 (81%)                               | 6 (19%)    | 31 (100%) | 54 (76%)                       | 17 (24%)   | 71 <sup>b</sup> (100%) | 0.66                  |
| 5. Determine Rh genotype of Rh negative and Du positive specimens.                                                                    | 29 (94%)                               | 2 (6%)     | 31 (100%) | 64 (89%)                       | 8 (11%)    | 72 (100%)              | 0.54                  |
| 6. Implement a system for selecting and issuing blood and for receiving blood.                                                        | 4 (13%)                                | 27 (87%)   | 31 (100%) | 30 (42%)                       | 41 (58%)   | 71 <sup>b</sup> (100%) | 8.36 <sup>a</sup>     |
| 7. Perform daily quality control for all reagents and equipment used.                                                                 | 30 (97%)                               | 1 (3%)     | 31 (100%) | 66 (92%)                       | 6 (8%)     | 72 (100%)              | 0.89                  |
| 8. Interpret quality control records and identify need for change.                                                                    | 2 (6%)                                 | 29 (94%)   | 31 (100%) | 32 (44%)                       | 40 (56%)   | 72 (100%)              | 14.15 <sup>a</sup>    |
| 9. Determine patient eligibility for Rh Gam.                                                                                          | 21 (68%)                               | 10 (32%)   | 31 (100%) | 41 (57%)                       | 31 (43%)   | 72 (100%)              | 1.05                  |
| 10. Maintain records of blood donation in accordance with applicable regulations.                                                     | 27 (87%)                               | 4 (13%)    | 31 (100%) | 64 (89%)                       | 8 (11%)    | 72 (100%)              | 0.07                  |
| 11. Resolve any discrepancies in forward and reverse /B/ grouping.                                                                    | 10 (32%)                               | 21 (68%)   | 31 (100%) | 33 (46%)                       | 39 (54%)   | 72 (100%)              | 1.64                  |
| 12. Perform and interpret HLA procedures.                                                                                             | 5 (16%)                                | 26 (84%)   | 31 (100%) | 29 (41%)                       | 41 (59%)   | 70 <sup>c</sup> (100%) | 5.32                  |
| 13. Perform and interpret hematological, serological and immuno-fluorescent tests for SLE and rheumatoid arthritis.                   | 16 (52%)                               | 15 (48%)   | 31 (100%) | 47 (66%)                       | 24 (34%)   | 71 <sup>b</sup> (100%) | 1.94                  |
| 14. Distinguish a positive from a negative reaction as the end point of an immunology test according to specifications.               | 29 (94%)                               | 2 (6%)     | 31 (100%) | 67 (93%)                       | 5 (7%)     | 72 (100%)              | 0.01                  |
| 15. Recognize unexpected reaction, cross reactions and errors in test.                                                                | 25 (81%)                               | 6 (19%)    | 31 (100%) | 60 (83%)                       | 12 (17%)   | 72 (100%)              | 0.11                  |

<sup>a</sup>Four respondents stated an M.D. should perform the task.

<sup>b</sup>One respondent stated an M.D. should perform the task.

<sup>c</sup>Two respondents stated an M.D. should perform the task.

<sup>a</sup>Significant at the .01 level ( $\chi^2 = 6.64$ ,  $df = 1$ ).

educators selected the MT as the practitioner to perform and interpret special tests for the diagnosis of collagen disorders. The remaining 52 percent felt confident that this study could be conducted by both the MT and MLT.

A number of the laboratory directors considered items three, four and six sufficiently difficult to require the knowledge of an M.D. Examination of these tasks revealed a higher taxonomy level of performance was needed, but the medical technology educators considered these behaviors appropriate for the M.T.

#### Clinical Chemistry

The largest number of statistically significant values was obtained when compiling the Clinical Chemistry data. Table 3, demonstrates the results received from the respondents relative to the 15 competencies in the division of Clinical Chemistry.

On task four, 26 or 84 percent of the educators identified the MT as the individual who should troubleshoot the quality control system, whereas 38 or 53 percent of the laboratory directors concluded that both MLT and MT personnel should be proficient in this area. Task item four resulted in a  $\chi^2$  value of 11.97 which is significant at the .01 level.

A statistically significant  $\chi^2$  value of 8.97 at the .01 level was computed for task seven. Fifty-eight or 81 percent of the laboratory directors considered operating and maintaining less routine instrumentation as a necessary skill for both the graduates, while 15 or 48 percent

Table 3  
Total Respondents' Preference for Performance of Clinical Chemistry Tasks

| Tasks                                                                                                                              | Respondents                            |            |           |                                |            |                        | X <sup>2</sup> Values |
|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------|-----------|--------------------------------|------------|------------------------|-----------------------|
|                                                                                                                                    | Medical Technology Educators<br>N = 31 |            |           | Laboratory Directors<br>N = 72 |            |                        |                       |
|                                                                                                                                    | MLT<br>and<br>MT                       | MT<br>Only | Total     | MLT<br>and<br>MT               | MT<br>Only | Total                  |                       |
| 1. Inspect and evaluate suitability of sample.                                                                                     | 31 (100%)                              | 0 (0%)     | 31 (100%) | 72 (100%)                      | 0 (0%)     | 72 (100%)              | 0                     |
| 2. Select quality of reagents and diluents to be used.                                                                             | 15 (48%)                               | 16 (52%)   | 31 (100%) | 51 (71%)                       | 21 (29%)   | 72 (100%)              | 4.74                  |
| 3. Monitor the quality control program, applying principles of statistics.                                                         | 8 (26%)                                | 23 (74%)   | 31 (100%) | 32 (44%)                       | 40 (56%)   | 72 (100%)              | 3.17                  |
| 4. Determine course of action if standards or control samples do not give acceptable values.                                       | 5 (16%)                                | 26 (84%)   | 31 (100%) | 38 (53%)                       | 34 (47%)   | 72 (100%)              | 11.97*                |
| 5. Perform routine chemical analyses of blood and body fluid.                                                                      | 31 (100%)                              | 0 (0%)     | 31 (100%) | 67 (93%)                       | 5 (7%)     | 72 (100%)              | 0.02                  |
| 6. Select, operate and maintain routine equipment and instruments.                                                                 | 28 (90%)                               | 3 (10%)    | 31 (100%) | 64 (89%)                       | 8 (11%)    | 72 (100%)              | 0.05                  |
| 7. Calibrate, operate and maintain less routine instruments and equipment (e.g. blood gas, gas chromatography, atomic absorption). | 16 (52%)                               | 15 (48%)   | 31 (100%) | 58 (81%)                       | 14 (19%)   | 72 (100%)              | 8.97*                 |
| 8. Evaluate and interpret results of less routine procedures.                                                                      | 1 (3%)                                 | 30 (97%)   | 31 (100%) | 41 (58%)                       | 30 (42%)   | 71 <sup>a</sup> (100%) | 26.48*                |
| 9. Perform and evaluate results of lipoprotein electrophoresis and immunoglobulin studies.                                         | 8 (26%)                                | 23 (74%)   | 31 (100%) | 36 (51%)                       | 35 (49%)   | 71 <sup>a</sup> (100%) | 0.33                  |
| 10. Isolate and purify analyte from the specimen for endocrine and toxicology determinations.                                      | 18 (58%)                               | 13 (42%)   | 31 (100%) | 43 (60%)                       | 29 (40%)   | 72 (100%)              | 0.02                  |
| 11. Evaluate the analytical process and results from endocrine and toxicology studies.                                             | 3 (10%)                                | 28 (90%)   | 31 (100%) | 12 (17%)                       | 60 (83%)   | 72 (100%)              | 2.27                  |
| 12. Perform and interpret results of radioimmuno assay determinations.                                                             | 19 (61%)                               | 12 (39%)   | 31 (100%) | 54 (75%)                       | 18 (25%)   | 72 (100%)              | 4.77                  |
| 13. Correlate test results with other patient data and recommend if additional tests are needed.                                   | 0 (0%)                                 | 31 (100%)  | 31 (100%) | 20 (31%)                       | 44 (69%)   | 64 <sup>b</sup> (100%) | 12.27*                |
| 14. Perform and interpret routine urinalysis.                                                                                      | 29 (94%)                               | 2 (6%)     | 31 (100%) | 70 (97%)                       | 2 (3%)     | 72 (100%)              | 0.78                  |
| 15. Perform and interpret miscellaneous urine chemistry tests (e.g. renal clearance, heavy metals, renin).                         | 19 (61%)                               | 12 (29%)   | 31 (100%) | 50 (69%)                       | 22 (31%)   | 72 (100%)              | 0.65                  |

<sup>a</sup>One respondent stated an M.D. should perform the task.

<sup>b</sup>Eight respondents stated an M.D. should perform the task.

\*Significant at the .01 level ( $\chi^2 = 6.64$ ,  $df = 1$ ).

of the medical technology educators identified this as a MT skill.

Clinical Chemistry task item eight is significant at the .01 level with a calculated  $X^2$  value of 26.48. Only one or 3 percent of the medical technology educators felt that an MLT was able to evaluate and interpret results from less routine procedures such as atomic absorption and gas chromatography. Over one-half of the laboratory directors, 41 or 58 percent, perceived this competency to be required for both levels of laboratory practitioners.

Thirty-one or 100 percent of the educators defined correlation of test results with patient data as a MT competency, while 20 or 31 percent of the directors are of the opinion that an MLT could undertake this activity. Thus, the  $X^2$  value of 12.27 for task 13 is significant at the .01 level.

Medical technology educators showed difficulty in assigning tasks two and seven to a specific practitioner. These professionals were divided with approximately 50 percent stating that the MLT and MT should both be able to select appropriate reagents for analysis and calibrate and maintain less routine equipment, whereas the other 50 percent believed these activities should be reserved for the MT.

Nine of the laboratory directors stated that tasks eight, nine and thirteen should be undertaken only by a physician. These competencies require that the practitioner evaluate and interpret results obtained on less routine Clinical Chemistry studies. The medical tech-

nology educators identified the MT as the major performer of these tasks.

#### Clinical Microbiology

As indicated in Table 4, three of the 13 competencies in the area of Clinical Microbiology are significant at the .01 level when comparing the perceptions of the laboratory directors and the medical technology educators. The calculated  $X^2$  value for task item four is 7.05; item five is 7.75; and task nine is 9.33.

Fifty-six or 78 percent of the laboratory directors perceived task four, evaluation and interpretation of biochemical test for identification of mycobacteria, as a skill for both MLT and MT graduates. The medical technology educators were more conservative with 15 or 47 percent of them restricting this procedure to MT's.

In Clinical Microbiology task five, 69 or 96 percent of the laboratory directors concluded that both levels of laboratorians should be responsible for inoculating and interpreting antimicrobial susceptibility tests. Ten or 32 percent of the medical technology educators felt this task would best be performed by the MT.

The majority of the educators, 30 or 97 percent, felt that competency nine, interpretation and evaluation of quality control records, should be required only of the MT. Twenty-two or 31 percent of the laboratory directors believed that the MLT should also be proficient in the area of quality control analysis.

It is interesting to note that Clinical Microbiology task four

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\*Six respondents stated an N.D. should perform the task.  
Significant at the .01 level ( $\chi^2 = 6.64$ ,  $df = 1$ ).

not only yielded a statistically significant  $X^2$  value, but also elicited disagreement from the medical technology educators. Sixteen or 53 percent of the educators perceived evaluation and interpretation of biochemical tests for the identification of mycobacteria as a competency required of both levels of practitioners, whereas the remaining 15 or 47 percent of the medical technology educators believed this determination should be reserved for the MT.

Six laboratory directors considered task 10, correlation of culture results with other patient data, to require the expertise of a physician. The medical technology educators delegated this task to a MT.

#### Comparison of Responses of Laboratory Directors

For the purposes of examining the data obtained from the survey instruments, overall responses of the laboratory directors were first compared to those of the medical technology educators. The laboratory directors were then separated into four groups and their perceptions noted. The groups were: (1) urban, less than 200 bed hospital; (2) rural, less than 200 bed hospital; (3) urban, more than 200 bed hospital and; (4) rural, more than 200 bed hospital.

In an effort to determine where similarities and differences exist in competency requirements as perceived by the four types of laboratory directors, a series of  $X^2$  analyses were conducted.

#### Hematology

Table 5 shows the  $X^2$  values on each of the 12 Hematology performance

Table 5  
Laboratory Directors' Preference for Performance of Hematology Tasks

| Tasks <sup>a</sup>                                                                   | Laboratory Directors                           |            |                        |                                                |            |                       |                                                |            |                        |                                                |            |                        | x <sup>2</sup> Value |
|--------------------------------------------------------------------------------------|------------------------------------------------|------------|------------------------|------------------------------------------------|------------|-----------------------|------------------------------------------------|------------|------------------------|------------------------------------------------|------------|------------------------|----------------------|
|                                                                                      | Urban Director<br>> 200 Bed Hospital<br>N = 32 |            |                        | Urban Director<br>∠ 200 Bed Hospital<br>N = 10 |            |                       | Rural Director<br>> 200 Bed Hospital<br>N = 16 |            |                        | Rural Director<br>∠ 200 Bed Hospital<br>N = 14 |            |                        |                      |
|                                                                                      | MLT<br>and<br>MT                               | MT<br>Only | Total                  | MLT<br>and<br>MT                               | MT<br>Only | Total                 | MLT<br>and<br>MT                               | MT<br>Only | Total                  | MLT<br>and<br>MT                               | MT<br>Only | Total                  |                      |
| 1. Enumerate formed elements in blood using microscopic and instrumental techniques. | 32 (100%)                                      | 0 (0%)     | 32 (100%)              | 10 (100%)                                      | 0 (0%)     | 10 (100%)             | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 0                    |
| 2. Perform daily maintenance and calibration of automated cell counting equipment.   | 29 (91%)                                       | 3 (9%)     | 32 (100%)              | 9 (90%)                                        | 1 (10%)    | 10 (100%)             | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 3.03                 |
| 3. Identify immature or abnormal cells on bone marrow smears.                        | 9 (28%)                                        | 22 (72%)   | 31 <sup>a</sup> (100%) | 1 (11%)                                        | 8 (89%)    | 9 <sup>a</sup> (100%) | 1 (16%)                                        | 15 (84%)   | 16 (100%)              | 1 (8%)                                         | 11 (92%)   | 12 <sup>b</sup> (100%) | 5.18                 |
| 4. Interpret quality control records and identify need for change.                   | 10 (31%)                                       | 22 (69%)   | 32 (100%)              | 2 (20%)                                        | 8 (80%)    | 10 (100%)             | 1 (16%)                                        | 15 (84%)   | 16 (100%)              | 3 (2%)                                         | 11 (98%)   | 14 (100%)              | 3.90                 |
| 5. Compare indices with morphologic and quantitative data.                           | 29 (91%)                                       | 3 (9%)     | 32 (100%)              | 9 (90%)                                        | 1 (10%)    | 10 (100%)             | 14 (88%)                                       | 2 (12%)    | 16 (100%)              | 13 (93%)                                       | 1 (7%)     | 14 (100%)              | 0.25                 |
| 6. Troubleshoot Coagulation procedural problems.                                     | 18 (56%)                                       | 14 (44%)   | 32 (100%)              | 8 (80%)                                        | 2 (20%)    | 10 (100%)             | 10 (63%)                                       | 6 (37%)    | 16 (100%)              | 9 (56%)                                        | 5 (44%)    | 14 (100%)              | 1.86                 |
| 7. Correlate hematology values and determine appropriateness of results.             | 11 (34%)                                       | 19 (66%)   | 30 <sup>b</sup> (100%) | 2 (22%)                                        | 7 (78%)    | 9 <sup>a</sup> (100%) | 3 (21%)                                        | 11 (79%)   | 14 <sup>b</sup> (100%) | 2 (15%)                                        | 11 (85%)   | 13 <sup>a</sup> (100%) | 2.62                 |
| 8. Perform routine cytochemistry stains on blood smears.                             | 28 (86%)                                       | 4 (14%)    | 32 (100%)              | 8 (89%)                                        | 1 (11%)    | 9 <sup>a</sup> (100%) | 15 (94%)                                       | 1 (6%)     | 16 (100%)              | 13 (93%)                                       | 1 (7%)     | 14 (100%)              | 0.94                 |
| 9. Select appropriate reagents and instruments essential for the analysis.           | 18 (56%)                                       | 14 (44%)   | 32 (100%)              | 1 (11%)                                        | 8 (89%)    | 9 <sup>a</sup> (100%) | 8 (50%)                                        | 8 (50%)    | 16 (100%)              | 4 (29%)                                        | 10 (71%)   | 14 (100%)              | 7.50                 |
| 10. Perform cell enzyme assays and special stains.                                   | 24 (75%)                                       | 8 (25%)    | 32 (100%)              | 2 (22%)                                        | 7 (78%)    | 9 <sup>a</sup> (100%) | 12 (75%)                                       | 4 (25%)    | 16 (100%)              | 7 (50%)                                        | 7 (50%)    | 14 (100%)              | 10.40                |
| 11. Perform and Interpret routine Coagulation studies.                               | 27 (84%)                                       | 5 (16%)    | 32 (100%)              | 9 (90%)                                        | 1 (10%)    | 10 (100%)             | 13 (81%)                                       | 3 (19%)    | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 2.91                 |
| 12. Perform and identify normal and abnormal cells on peripheral smears.             | 29 (91%)                                       | 3 (9%)     | 32 (100%)              | 9 (90%)                                        | 1 (10%)    | 10 (100%)             | 15 (94%)                                       | 1 (6%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 1.49                 |

<sup>a</sup>For presentation of data, tasks have been condensed.

<sup>a</sup>One respondent stated an H.D. should perform the task.  
<sup>b</sup>Two respondents stated an H.D. should perform the task.  
NOTE: (X<sup>2</sup> = 11.34, df = 3).

tasks when comparing the responses of the laboratory directors. As evidenced from the data, there is no significant difference in the perceptions of these professionals in the discipline of Hematology.

#### Immunohematology

As indicated in table 6, the computed  $\chi^2$  value is significant at the .01 level for tasks three and nine when contrasting the perceptions of the laboratory directors in the area of Immunohematology. The calculated  $\chi^2$  value for task item three is 16.13 and 13.74 for item nine.

On task three, 23 or 79 percent of the directors in urban greater than 200 bed hospitals, and 4 or 71 percent of the directors in rural, less than 200 bed hospitals identified the MT as the individual who should investigate transfusion reactions. Nine or 90 percent of the urban, less than 200 bed hospital directors perceived both the MLT and the MT sufficiently able to undertake this investigation, whereas the directors functioning in rural greater than 200 bed hospitals had difficulty in assigning the task to a specific practitioner.

Twelve or 75 percent of the directors functioning in rural, greater than 200 bed hospitals defined task nine, determining patients eligibility for RhoGam, as a MT competency. The majority of the other three types of directors perceived this competency to be required by both levels of practitioners.

#### Clinical Chemistry

The largest number of statistically significant values was obtained

TABLE 6  
Laboratory Directors' Preference for Performance of Immunohematology Tasks

| Tasks*                                                                                                                                | Laboratory Directors                          |            |                        |                                               |            |           |                                               |            |                        |                                               |            |           | x <sup>2</sup> Value |
|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------|------------------------|-----------------------------------------------|------------|-----------|-----------------------------------------------|------------|------------------------|-----------------------------------------------|------------|-----------|----------------------|
|                                                                                                                                       | Urban Director<br>>200 Bed Hospital<br>N = 32 |            |                        | Urban Director<br><200 Bed Hospital<br>N = 10 |            |           | Rural Director<br>>200 Bed Hospital<br>N = 16 |            |                        | Rural Director<br><200 Bed Hospital<br>N = 14 |            |           |                      |
|                                                                                                                                       | MLT<br>and<br>MT                              | MT<br>Only | Total                  | MLT<br>and<br>MT                              | MT<br>Only | Total     | MLT<br>and<br>MT                              | MT<br>Only | Total                  | MLT<br>and<br>MT                              | MT<br>Only | Total     |                      |
| 1. Type, screen and crossmatch blood for transfusion.                                                                                 | 30 (94%)                                      | 2 (6%)     | 32 (100%)              | 10 (100%)                                     | 0 (0%)     | 10 (100%) | 15 (94%)                                      | 1 (6%)     | 16 (100%)              | 14 (100%)                                     | 0 (0%)     | 14 (100%) | 1.57                 |
| 2. Perform antibody identification utilizing cell panels.                                                                             | 27 (84%)                                      | 5 (16%)    | 32 (100%)              | 6 (60%)                                       | 4 (40%)    | 10 (100%) | 14 (88%)                                      | 2 (12%)    | 16 (100%)              | 10 (71%)                                      | 4 (29%)    | 14 (100%) | 3.94                 |
| 3. Investigate transfusion reactions and identify possible cause by integrating immunological investigation with other clinical data. | 6 (21%)                                       | 23 (79%)   | 29 <sup>a</sup> (100%) | 9 (90%)                                       | 1 (10%)    | 10 (100%) | 7 (47%)                                       | 8 (53%)    | 15 <sup>b</sup> (100%) | 4 (29%)                                       | 10 (71%)   | 14 (100%) | 16.13*               |
| 4. Determine donor eligibility and perform donor phlebotomy.                                                                          | 26 (84%)                                      | 5 (16%)    | 31 <sup>b</sup> (100%) | 8 (80%)                                       | 2 (20%)    | 10 (100%) | 8 (50%)                                       | 8 (50%)    | 16 (100%)              | 12 (75%)                                      | 2 (25%)    | 14 (100%) | 7.81                 |
| 5. Determine Rh genotype of Rh negative and Du positive specimens.                                                                    | 30 (94%)                                      | 2 (6%)     | 32 (100%)              | 10 (100%)                                     | 0 (0%)     | 10 (100%) | 14 (88%)                                      | 2 (12%)    | 16 (100%)              | 10 (71%)                                      | 4 (29%)    | 14 (100%) | 6.37                 |
| 6. Implement a system for selecting and issuing blood and for receiving blood.                                                        | 12 (38%)                                      | 20 (62%)   | 32 (100%)              | 6 (60%)                                       | 4 (40%)    | 10 (100%) | 8 (50%)                                       | 8 (50%)    | 16 (100%)              | 4 (29%)                                       | 10 (71%)   | 14 (100%) | 2.92                 |
| 7. Perform daily quality control for all reagents and equipment used.                                                                 | 28 (88%)                                      | 4 (12%)    | 32 (100%)              | 10 (100%)                                     | 0 (0%)     | 10 (100%) | 14 (88%)                                      | 2 (12%)    | 16 (100%)              | 14 (100%)                                     | 0 (0%)     | 14 (100%) | 3.27                 |
| 8. Interpret quality control records and identify need for change.                                                                    | 12 (38%)                                      | 20 (62%)   | 32 (100%)              | 9 (90%)                                       | 1 (10%)    | 10 (100%) | 8 (50%)                                       | 8 (50%)    | 16 (100%)              | 3 (21%)                                       | 11 (79%)   | 14 (100%) | 10.07                |
| 9. Determine patient eligibility for RhGam.                                                                                           | 17 (53%)                                      | 15 (47%)   | 32 (100%)              | 8 (80%)                                       | 2 (20%)    | 10 (100%) | 4 (25%)                                       | 12 (75%)   | 16 (100%)              | 12 (86%)                                      | 2 (14%)    | 14 (100%) | 13.74*               |
| 10. Maintain records of blood donation in accordance with applicable regulations.                                                     | 27 (84%)                                      | 5 (16%)    | 32 (100%)              | 10 (100%)                                     | 0 (0%)     | 10 (100%) | 14 (88%)                                      | 2 (12%)    | 16 (100%)              | 13 (93%)                                      | 1 (7%)     | 14 (100%) | 2.16                 |
| 11. Resolve any discrepancies in forward and reverse ABO grouping.                                                                    | 17 (53%)                                      | 15 (47%)   | 32 (100%)              | 4 (40%)                                       | 6 (60%)    | 10 (100%) | 8 (50%)                                       | 8 (50%)    | 16 (100%)              | 4 (29%)                                       | 10 (71%)   | 14 (100%) | 2.61                 |
| 12. Perform and interpret HLA procedures.                                                                                             | 8 (27%)                                       | 22 (73%)   | 30 <sup>c</sup> (100%) | 3 (30%)                                       | 7 (70%)    | 10 (100%) | 4 (25%)                                       | 12 (75%)   | 16 (100%)              | 0 (0%)                                        | 14 (100%)  | 14 (100%) | 4.86                 |
| 13. Perform and interpret hematological, serological and immunofluorescent tests for SLE and rheumatoid arthritis.                    | 20 (63%)                                      | 12 (37%)   | 32 (100%)              | 9 (90%)                                       | 1 (10%)    | 10 (100%) | 8 (50%)                                       | 8 (50%)    | 16 (100%)              | 10 (71%)                                      | 4 (29%)    | 14 (100%) | 4.62                 |
| 14. Distinguish a positive from a negative reaction or the end point of an immunology test according to specifications.               | 30 (94%)                                      | 2 (6%)     | 32 (100%)              | 10 (100%)                                     | 0 (0%)     | 10 (100%) | 13 (81%)                                      | 3 (19%)    | 16 (100%)              | 14 (100%)                                     | 0 (0%)     | 14 (100%) | 5.27                 |
| 15. Recognize unexpected reactions, cross reactions and errors in test.                                                               | 28 (88%)                                      | 4 (12%)    | 32 (100%)              | 9 (90%)                                       | 1 (10%)    | 10 (100%) | 12 (75%)                                      | 4 (25%)    | 16 (100%)              | 11 (79%)                                      | 3 (21%)    | 14 (100%) | 1.75                 |

\*For presentation of data, tasks have been condensed.

<sup>a</sup>Three respondents stated an M.D. should perform the task.

<sup>b</sup>One respondent stated an M.D. should perform the task.

<sup>c</sup>Two respondents stated an M.D. should perform the task.

\*Significant at the .01 level ( $\chi^2 = 11.34$ ,  $df = 3$ )

when compiling Clinical Chemistry data. Table 7 demonstrates the results received from the respondents relative to the competencies in the division of Clinical Chemistry.

Clinical Chemistry task item eight is significant at the .01 level with a calculated  $X^2$  value of 33.85. Twenty-nine or 91 percent of the urban directors in greater than 200 bed hospitals, and 6 or 60 percent of the urban directors in less than 200 bed hospitals felt that both MLT and MT graduates should be able to evaluate and interpret results of less routine procedures. The majority of the rural directors, both in greater than 200 bed hospitals and less than 200 bed hospitals, believed this task should be reserved for the MT.

Ten or 83 percent of the directors functioning in rural, less than 200 bed hospitals concluded that task ten, isolating and purifying analyte for endocrine and toxicology determinations, requires the expertise of a MT. The majority of the other three types of directors considered this performance skill to be required of both MLT and MT graduates. Clinical Chemistry task ten is significant at the .01 level with a  $X^2$  value of 15.72.

A large majority of the laboratory directors from urban, greater than 200 bed hospitals; rural, less than 200 bed hospitals; and rural, greater than 200 bed hospitals identified the MT as the individual to undertake task 13, the correlation of test results with other patient data. Eight or 80 percent of the urban, less than 200 bed hospital

Table 7  
Laboratory Directors' Preference for Performance of Clinical Chemistry Tasks

| Tasks <sup>a</sup>                                                                               | Laboratory Directors                           |            |                        |                                                |            |           |                                                |            |                        |                                                |            |                        | X <sup>2</sup> Value |
|--------------------------------------------------------------------------------------------------|------------------------------------------------|------------|------------------------|------------------------------------------------|------------|-----------|------------------------------------------------|------------|------------------------|------------------------------------------------|------------|------------------------|----------------------|
|                                                                                                  | Urban Director<br>≥ 200 Bed Hospital<br>N = 32 |            |                        | Urban Director<br>≤ 200 Bed Hospital<br>N = 10 |            |           | Rural Director<br>≥ 200 Bed Hospital<br>N = 16 |            |                        | Rural Director<br>≤ 200 Bed Hospital<br>N = 14 |            |                        |                      |
|                                                                                                  | MLT<br>and<br>MT                               | MT<br>Only | Total                  | MLT<br>and<br>MT                               | MT<br>Only | Total     | MLT<br>and<br>MT                               | MT<br>Only | Total                  | MLT<br>and<br>MT                               | MT<br>Only | Total                  |                      |
| 1. Inspect and evaluate suitability of sample.                                                   | 32 (100%)                                      | 0 (0%)     | 32 (100%)              | 10 (100%)                                      | 0 (0%)     | 10 (100%) | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 0                    |
| 2. Select quality reagents and diluents to be used.                                              | 24 (75%)                                       | 8 (25%)    | 32 (100%)              | 8 (80%)                                        | 2 (20%)    | 10 (100%) | 12 (75%)                                       | 4 (25%)    | 16 (100%)              | 7 (50%)                                        | 7 (50%)    | 14 (100%)              | 3.75                 |
| 3. Monitor the quality control program, applying principles of statistics.                       | 14 (44%)                                       | 18 (56%)   | 32 (100%)              | 9 (90%)                                        | 1 (10%)    | 10 (100%) | 4 (25%)                                        | 12 (75%)   | 16 (100%)              | 5 (36%)                                        | 9 (64%)    | 14 (100%)              | 11.29                |
| 4. Determine course of action if standards do not give acceptable values.                        | 18 (56%)                                       | 14 (44%)   | 32 (100%)              | 8 (80%)                                        | 2 (20%)    | 10 (100%) | 5 (31%)                                        | 11 (69%)   | 16 (100%)              | 8 (57%)                                        | 6 (43%)    | 14 (100%)              | 6.09                 |
| 5. Perform routine chemical analyses of blood and body fluid.                                    | 30 (94%)                                       | 2 (6%)     | 32 (100%)              | 10 (100%)                                      | 0 (0%)     | 10 (100%) | 15 (94%)                                       | 1 (6%)     | 16 (100%)              | 12 (86%)                                       | 2 (14%)    | 14 (100%)              | 1.95                 |
| 6. Select, operate and maintain routine equipment and instruments.                               | 29 (91%)                                       | 3 (9%)     | 32 (100%)              | 8 (80%)                                        | 2 (20%)    | 10 (100%) | 13 (81%)                                       | 3 (19%)    | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 3.59                 |
| 7. Calibrate, operate and maintain less routine instruments and equipment.                       | 23 (72%)                                       | 9 (28%)    | 32 (100%)              | 9 (90%)                                        | 1 (10%)    | 10 (100%) | 13 (81%)                                       | 3 (19%)    | 16 (100%)              | 13 (93%)                                       | 1 (7%)     | 14 (100%)              | 3.47                 |
| 8. Evaluate and interpret results of less routine procedures.                                    | 29 (91%)                                       | 3 (9%)     | 32 (100%)              | 6 (60%)                                        | 4 (40%)    | 10 (100%) | 3 (19%)                                        | 13 (81%)   | 16 (100%)              | 3 (21%)                                        | 11 (79%)   | 14 (100%)              | 33.85*               |
| 9. Perform and evaluate results of lipoprotein electrophoresis and immunoglobulin studies.       | 14 (44%)                                       | 18 (56%)   | 32 (100%)              | 8 (80%)                                        | 2 (20%)    | 10 (100%) | 11 (69%)                                       | 5 (31%)    | 16 (100%)              | 4 (29%)                                        | 10 (71%)   | 14 (100%)              | 10.11                |
| 10. Isolate and purify analyte from the specimen for endocrine and toxicology determinations.    | 18 (56%)                                       | 14 (44%)   | 32 (100%)              | 7 (70%)                                        | 3 (30%)    | 10 (100%) | 14 (88%)                                       | 2 (12%)    | 16 (100%)              | 2 (17%)                                        | 10 (83%)   | 12 <sup>a</sup> (100%) | 15.72*               |
| 11. Evaluate the analytical process and results from endocrine and toxicology studies.           | 7 (22%)                                        | 25 (78%)   | 32 (100%)              | 2 (20%)                                        | 8 (80%)    | 10 (100%) | 6 (38%)                                        | 10 (62%)   | 16 (100%)              | 1 (7%)                                         | 13 (93%)   | 14 (100%)              | 4.03                 |
| 12. Perform and interpret results of radioimmune assay determinations.                           | 21 (66%)                                       | 11 (34%)   | 32 (100%)              | 8 (80%)                                        | 2 (20%)    | 10 (100%) | 13 (81%)                                       | 3 (19%)    | 16 (100%)              | 12 (86%)                                       | 2 (14%)    | 14 (100%)              | 2.82                 |
| 13. Correlate test results with other patient data are recommend if additional tests are needed. | 9 (30%)                                        | 21 (70%)   | 30 <sup>a</sup> (100%) | 8 (80%)                                        | 2 (20%)    | 10 (100%) | 1 (8%)                                         | 11 (92%)   | 12 <sup>b</sup> (100%) | 1 (8%)                                         | 11 (92%)   | 12 <sup>a</sup> (100%) | 17.37*               |
| 14. Perform and interpret routine urinalysis.                                                    | 30 (94%)                                       | 2 (6%)     | 32 (100%)              | 10 (100%)                                      | 0 (0%)     | 10 (100%) | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 2.57                 |
| 15. Perform and interpret miscellaneous urine chemistry tests.                                   | 24 (75%)                                       | 8 (25%)    | 32 (100%)              | 8 (80%)                                        | 2 (20%)    | 10 (100%) | 14 (88%)                                       | 2 (12%)    | 16 (100%)              | 4 (29%)                                        | 10 (71%)   | 14 (100%)              | 14.47*               |

<sup>a</sup>For presentation of data, tasks have been condensed.

<sup>b</sup>Two respondents stated an M.D. should perform the task.

<sup>c</sup>Four respondents stated an M.D. should perform the task.

\*Significant at the .01 level (X<sup>2</sup> = 11.34, df = 3.)

directors perceived both the MLT and MT to be sufficiently able to undertake this investigation. A computed  $\chi^2$  value of 17.37 was obtained on task 13, which is significant at the .01 level.

Clinical Chemistry competency 15 yielded a statistically significant  $\chi^2$  value of 14.47. Seventy-five percent of the urban directors in greater than 200 bed hospitals; 80 percent of the directors from urban less than 200 bed hospitals; and 88 percent of the rural directors in greater than 200 bed hospitals responded that assaying miscellaneous urine chemistry tests should be performed by both levels of graduates. Seventy-one percent of the directors in urban, less than 200 bed hospitals considered this determination to be adequately complex to require the skill of a MT.

#### Clinical Microbiology

As indicated in Table 8, one of the 13 competencies in the area of Clinical Microbiology is significant at the .01 level when comparing the perceptions of the different types of laboratory directors. The calculated  $\chi^2$  value for task item seven is 20.19.

Twenty-eight or 88 percent of the directors in urban, greater than 200 bed hospitals; 14 or 88 percent of the directors functioning in rural, greater than 200 bed hospitals; and 9 or 64 percent of the rural, less than 200 bed hospital directors considered task seven, identifying parasites of medical importance, as a required behavior for both levels of practitioners. Eight or 80 percent of the directors functioning in urban, less than 200 bed hospitals felt this was a MT competency.

**Table 8**  
**Laboratory Directors' Preference for Performance of Clinical Microbiology Tasks**

| Tasks <sup>a</sup>                                                                             | Laboratory Directors                           |            |           |                                                |            |           |                                                |            |                        |                                                |            |                        | x <sup>2</sup> Value |
|------------------------------------------------------------------------------------------------|------------------------------------------------|------------|-----------|------------------------------------------------|------------|-----------|------------------------------------------------|------------|------------------------|------------------------------------------------|------------|------------------------|----------------------|
|                                                                                                | Urban Director<br>≥ 200 Bed Hospital<br>N = 32 |            |           | Urban Director<br>< 200 Bed Hospital<br>N = 10 |            |           | Rural Director<br>≥ 200 Bed Hospital<br>N = 16 |            |                        | Rural Director<br>< 200 Bed Hospital<br>N = 14 |            |                        |                      |
|                                                                                                | MLT<br>and<br>MT                               | MT<br>Only | Total     | MLT<br>and<br>MT                               | MT<br>Only | Total     | MLT<br>and<br>MT                               | MT<br>Only | Total                  | MLT<br>and<br>MT                               | MT<br>Only | Total                  |                      |
| 1. Inspect and evaluate suitability of specimen.                                               | 32 (100%)                                      | 0 (0%)     | 32 (100%) | 10 (100%)                                      | 0 (0%)     | 10 (100%) | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 0                    |
| 2. Prepare and inoculate the specimen for culture.                                             | 32 (100%)                                      | 0 (0%)     | 32 (100%) | 10 (100%)                                      | 0 (0%)     | 10 (100%) | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 0                    |
| 3. Prepare and interpret direct smears.                                                        | 30 (94%)                                       | 2 (6%)     | 32 (100%) | 10 (100%)                                      | 0 (0%)     | 10 (100%) | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 2.57                 |
| 4. Evaluate and interpret biochemical tests for the identification of mycobacteria.            | 25 (78%)                                       | 7 (22%)    | 32 (100%) | 9 (90%)                                        | 1 (10%)    | 10 (100%) | 11 (69%)                                       | 5 (31%)    | 16 (100%)              | 11 (79%)                                       | 3 (21%)    | 14 (100%)              | 1.99                 |
| 5. Inoculate and interpret antimicrobial susceptibility tests.                                 | 30 (94%)                                       | 2 (6%)     | 32 (100%) | 10 (100%)                                      | 0 (0%)     | 10 (100%) | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 13 (93%)                                       | 1 (7%)     | 14 (100%)              | 3.33                 |
| 6. Prepare wet mounts, concentrations and stained smears for parasitic examinations.           | 31 (97%)                                       | 1 (3%)     | 32 (100%) | 9 (90%)                                        | 1 (10%)    | 10 (100%) | 14 (88%)                                       | 2 (12%)    | 16 (100%)              | 12 (86%)                                       | 2 (14%)    | 14 (100%)              | 2.19                 |
| 7. Identify parasites of medical importance.                                                   | 28 (88%)                                       | 4 (12%)    | 32 (100%) | 2 (20%)                                        | 8 (80%)    | 10 (100%) | 14 (88%)                                       | 2 (12%)    | 16 (100%)              | 9 (64%)                                        | 5 (36%)    | 14 (100%)              | 20.19*               |
| 8. Prepare microbiological culture media.                                                      | 31 (97%)                                       | 1 (3%)     | 32 (100%) | 10 (100%)                                      | 0 (0%)     | 10 (100%) | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 1.27                 |
| 9. Interpret quality control records and identify need for change in procedures.               | 11 (34%)                                       | 21 (66%)   | 32 (100%) | 3 (30%)                                        | 7 (70%)    | 10 (100%) | 5 (31%)                                        | 11 (69%)   | 16 (100%)              | 3 (21%)                                        | 11 (79%)   | 14 (100%)              | 0.77                 |
| 10. Correlate culture results with other patient data and recommend additional tests/cultures. | 7 (22%)                                        | 25 (78%)   | 32 (100%) | 2 (20%)                                        | 8 (80%)    | 10 (100%) | 1 (8%)                                         | 12 (92%)   | 13 <sup>a</sup> (100%) | 4 (33%)                                        | 8 (67%)    | 12 <sup>b</sup> (100%) | 2.52                 |
| 11. Perform and interpret follow-up procedures leading to identification of fungi.             | 16 (50%)                                       | 16 (50%)   | 32 (100%) | 8 (80%)                                        | 2 (20%)    | 10 (100%) | 5 (31%)                                        | 11 (69%)   | 16 (100%)              | 3 (21%)                                        | 11 (79%)   | 14 (100%)              | 9.65                 |
| 12. Perform, evaluate and interpret biochemical tests for identification of bacteria.          | 21 (66%)                                       | 11 (34%)   | 32 (100%) | 8 (80%)                                        | 2 (20%)    | 10 (100%) | 12 (75%)                                       | 4 (25%)    | 16 (100%)              | 12 (86%)                                       | 2 (14%)    | 14 (100%)              | 2.33                 |
| 13. Prepare virologic specimens for transport to reference laboratory.                         | 29 (91%)                                       | 3 (9%)     | 32 (100%) | 9 (90%)                                        | 1 (10%)    | 10 (100%) | 16 (100%)                                      | 0 (0%)     | 16 (100%)              | 14 (100%)                                      | 0 (0%)     | 14 (100%)              | 3.03                 |

<sup>a</sup>For presentation of data, tasks have been condensed.

<sup>b</sup>Three respondents stated an M.D. should perform the task.

<sup>c</sup>Two respondents stated an M.D. should perform the task.

\*Significant at the .01 level ( $\chi^2 = 11.34$ ,  $df = 3$ ).

### Summary

Based upon the data obtained from the study, it is apparent that the medical technology educators and the laboratory directors do differ in their perceptions on several competencies expected of both MLT and MT graduates in contrast to those expected of MT graduate only. Twelve or 22 percent of the 55 competency items yielded statistically significant  $\chi^2$  values at the .01 confidence level. The different types of laboratory directors differ in their perceptions on a number of competencies expected of the two levels of laboratory technology graduates. Seven or 13 percent of the 55 competency items yielded statistically significant  $\chi^2$  values at the .01 confidence level.

## DISCUSSION

One of the major patterns to emerge from the study was the tendency for many items to be selected as appropriate for both levels of graduates. The respondents did not differ greatly in their perceptions on routine performance tasks expected of the MLT and MT. The laboratory directors and the medical technology educators did, however, differ when identifying the practitioner responsible for a number of tasks which require a higher degree of independent judgement such as problem-solving laboratory procedures and evaluating results.

In general, the medical technology educators were more conservative than the laboratory directors, and, as anticipated, restricted most of the higher level performance tasks to the MT. Of the 12 competency items which yielded statistically significant values, 10 were due to the fact that a large number of laboratory directors perceived the tasks to be appropriate for both the MLT and the MT. This finding is consistent with previous research which stated that a discrepancy appears to exist between the level of educational objectives and the performance of clinical laboratory skills, therefore, the two levels of personnel are often expected to perform at the same taxonomy level<sup>6</sup>.

The literature suggested that hospital size and location rather than educational preparation determines work responsibilities.<sup>3</sup> Examination of the data obtained from this study does not support this finding. The different types of laboratory directors did not consistently align them-

selves either with each other or themselves on a number of the competency items. Upon examining the seven statistically significant values obtained from the responses of laboratory directors functioning in rural greater than 200 bed hospitals and less than 200 bed hospitals verses urban directors of less than 200 bed hospitals and more than 200 bed hospitals, it is apparent that no specific pattern emerged.

The explanation for this finding may be twofold in nature: (1) The respondents were asked to answer the questionnaire according to their perceptions of "what should be", which possibly may have been influenced by pending legislation, whereas prior studies were based on present practice procedures; and (2) A number of the respondents do not appear to have a valid awareness of the educational preparedness of the graduates from the two different laboratory technology programs.

Listed below are several comments cited by the laboratory directors which seem to support this explanation:

My answers are based upon very little contact with MLT personnel. I visualize an MLT as a person who has minimal didactic training and even less bench work. I am much more aware of the technical skills and competencies of MT's. (Urban laboratory director, > 200 be hospital)

With CLIA on the horizon, we are hiring only MT or HEW qualified personnel. Until something definitive is generated from Washington, we prefer to have all our "techs" qualified and with similar backgrounds. (Urban laboratory directors, < 200 bed hospitals)

We are seeing more and more graduates of MT programs who are not experienced in the areas marked for MT only. They have not had adequate hands on experience in operating routine instrumentation during their 4th year training

and also experience in making the type of independent decisions that a MT graduate should be capable of making. This I blame on the training programs where the student technologists are not given subsequent problems of quality control and instrument performance responsibilities. Quite often there is no difference between the MT applicant and the MLT applicant as far as independent performance is concerned. (Urban laboratory director, >200 bed hospital)

From the results of this study, the following conclusions can be made:

- (1) There is general consensus amongst the respondents that both levels of graduates should be proficient in basic performance skills;
- (2) There is significant disagreement between the medical technology educators and the laboratory directors concerning expectations of the MLT and the MT on competencies of higher taxonomy levels;
- (3) Many laboratory directors still consider evaluation of patient results to require the expertise of a physician; and
- (4) The results of this study are not necessarily indicative of laboratory professionals in other geographic areas, therefore, conclusions can be generalized only to the Commonwealth of Pennsylvania.

#### Recommendations

Pending legislation and changes occurring in laboratory technology make it essential that medical technology educators and laboratory directors come to agreement concerning the role and function of associate degree and baccalaureate degree laboratory technology graduates. This study has shown that the problem of differentiating work responsibilities for these future practitioners remains unsolved.

Based upon the data obtained, the following recommendations are

submitted:

1. This study should be replicated with a larger population and over a wider geographic area. This would provide a mechanism whereby the validity and reliability of the instrument can be examined more thoroughly. In addition, since there were several task items which caused disagreement amongst the educators, in future studies a demographic analysis should be undertaken for both the medical technology educators and the laboratory directors.

2. Faculty members and education coordinators of medical laboratory technician and medical technology programs should participate on a State Program Evaluation Committee. The members of the Committee should clarify and define similarities and differences between the two programs and reassess their purposes and curricula. To be effective, meetings should be held on a regular basis in an effort to establish an ongoing process for defining competencies and designing competency-based curricula.

3. The data herein suggests that medical technology educators and laboratory directors need to share expectations and philosophies concerning appropriate preparation and usage of future laboratorians.

4. A joint conference of medical technology educators, laboratory directors and legislators should be convened to share expectations of laboratory personnel, and to identify specific delegations or responsibilities for the different levels of practitioners. This conference should take place before pending legislation is enacted.

REFERENCES

1. ASMT Competency Delineation Committee: Statements of competence of clinical laboratory practitioners. ASMT News, August, 1976, p. 4-7.
2. Cohen, ED, Korper SP: Medical laboratory personnel: clinical education and employment in Connecticut. American Journal of Medical Technology, 43.6: 531-535, 1977.
3. Gleich, CS, Routh, JI: A statistical significance testing hypotheses concerning clinical laboratory manpower. American Journal of Medical Technology, 40, 156-164, 1974.
4. Henderhan, RC, Schroeder, SA: An effective and efficient systems technique for establishing a competency performance-based program in the health sciences. Laboratory Medicine, 11, 93-95, 1980.
5. Kettering Medical Center: Career entry job descriptions for MT/MLT: A partial report of the Kettering project. Kettering, Ohio: The School, 1977.
6. McBride, K, Murphy, M: Comparing education and responsibilities. Lab World, November, 24-28, 1979.